

Haemodialysis : The Cornerstone

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Its Complicated

Socially

Physical

Psychologically

Spiritually



Role of Primary Physicians in Treatment of CKD Patients and Preparing for Dialysis

**Identify causes of kidney disease
(diabetes, hypertension,
obstruction, hyperuricemia,
infections, obstruction,
medications)**

**Treat the primary disease and
prolong renal function, for
example using ACE/ARB in
diabetics with CKD**

**Identify patients
with CKD**

**Refer to Nephrology at CKD Stage
3 (GFR=30-60 ml/min/1.73M²)**

Observe for signs of uremia

- Help to determine with patient, family and Nephrologist whether dialysis is indicated



- Preserve arm veins for hemodialysis access



- Expect and support access procedures at stage 4-5 (GFR<20 ml/min/1.73M²)



- Avoid damage to fistula or graft in arm



- Monitor graft and fistula function, report abnormalities



Outline

Indications

Modalities

Apparatus

Access

Acute complications of dialysis

Questions

Indications



Pericarditis or pleuritis



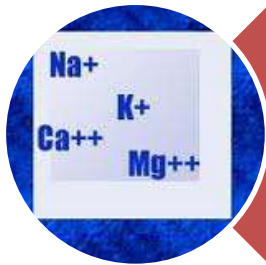
Progressive uremic encephalopathy or neuropathy (AMS, asterixis, myoclonus, seizures)



Bleeding diathesis



Fluid overload unresponsive to diuretics



Metabolic disturbances refractory to medical therapy (hyperkalemia, metabolic acidosis, hyper- or hypocalcemia, hyperphosphatemia)

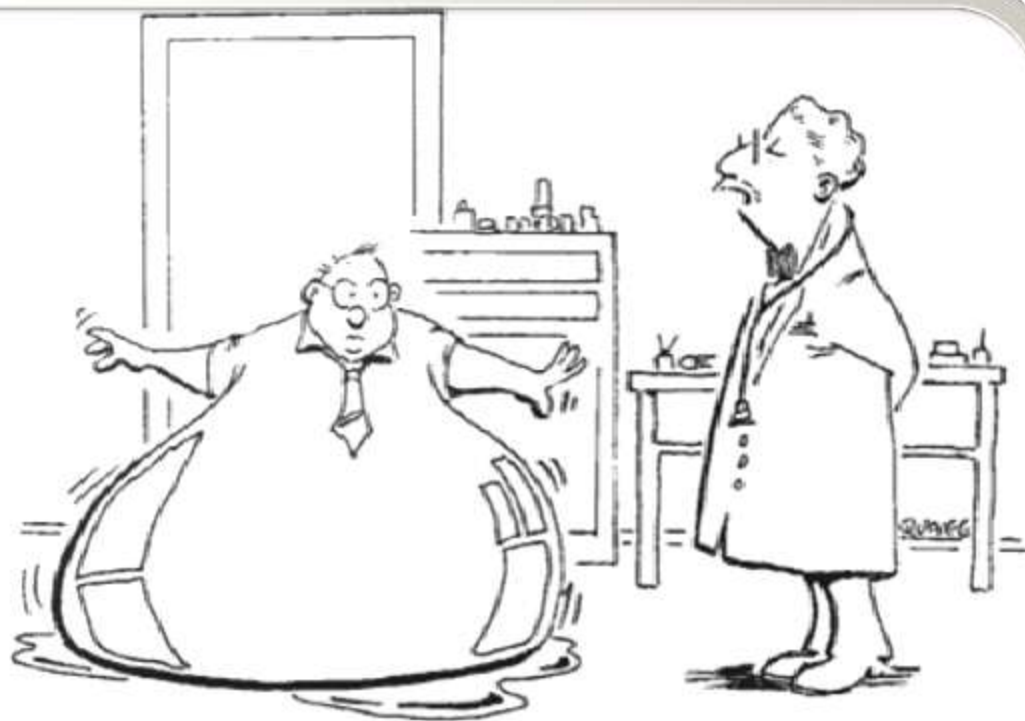


Persistent nausea/vomiting, weight loss, or malnutrition



Toxic overdose of a dialyzable drug

www.insideofdialysis.com



Your tests reveal that
you are retaining fluids!

Goals of Dialysis



Modalities

Intermittent



IHD

Intermittent
haemodialysis

IUF

Isolated
Ultrafiltration

Hybrid



SLEDD

Sustained (or slow)
low efficiency daily
dialysis

SLEDD-F

Sustained (or slow)
low efficiency daily
dialysis with
filtration

Continuous



CVVH

Continuous veno-venous
haemofiltration

CVVHD

Continuous veno-venous
haemodialysis

CVVHDF

Continuous veno-venous
haemodiafiltration

SCUF

Slow continuous
ultrafiltration

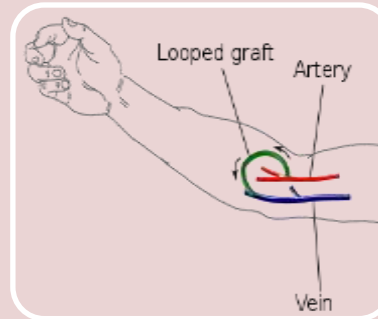
Hemodialysis Access



Acute dialysis catheter (vascular catheter, i.e. Quentin catheter)



Cuffed, tunneled dialysis catheter (Permcath)



Arteriovenous graft



Arteriovenous fistula

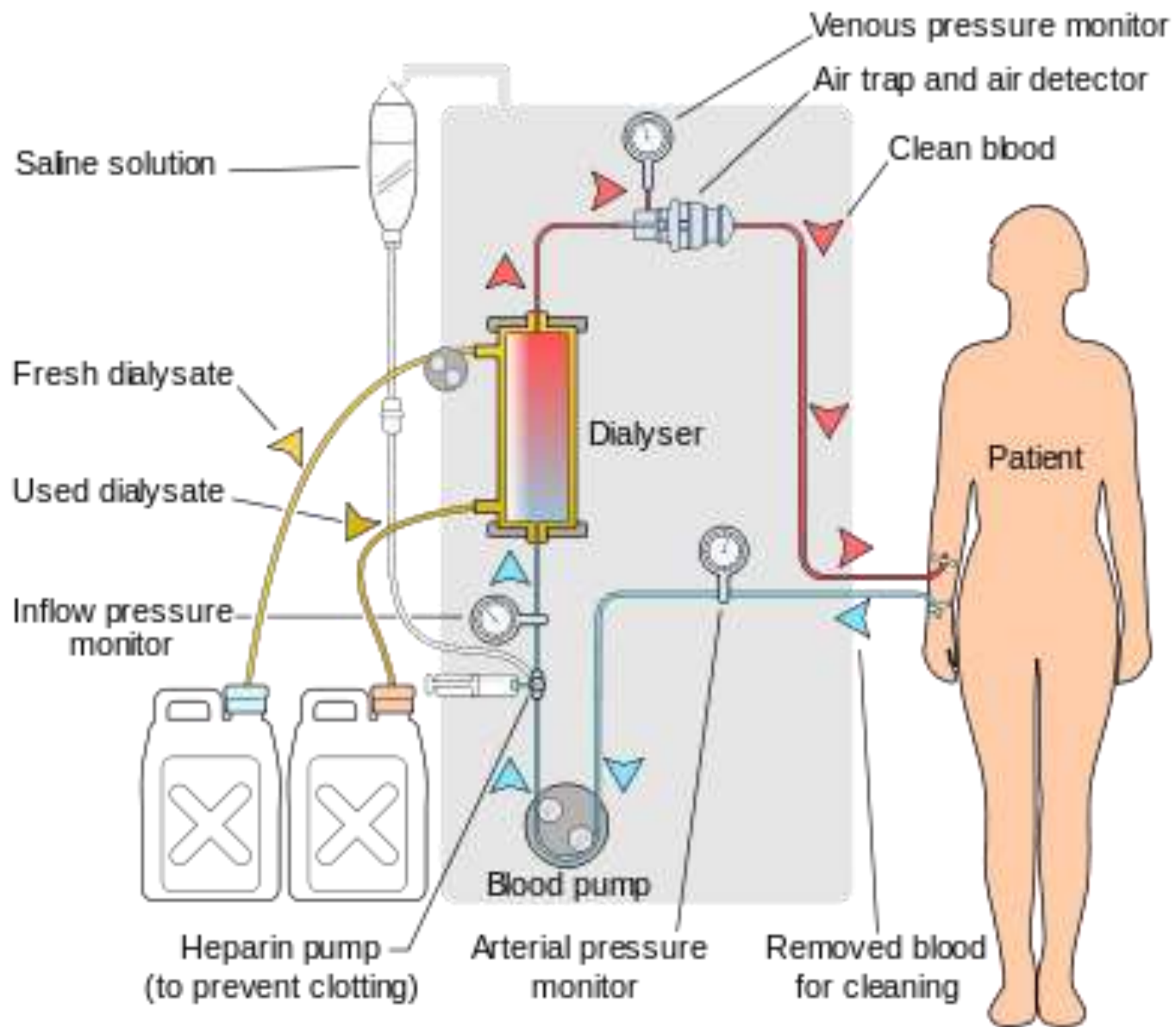
Hemodialysis Apparatus

Dialyzer

Dialysis solution

Tubing for transport of blood and dialysis solution

Machine to power and mechanically monitor the procedure



Purification Processes

Process	Contaminant
Carbon Adsorption	Chloramine, organics
Softener	Calcium, Mg
Reverse osmosis	Ionic contaminants, bacteria, endotoxin
Deionization	Ionic contaminants
Ultrafiltration	Bacteria, endotoxin



Toxic effects of water contaminants in HD

Contaminant	Possible effects
Aluminum	Dialysis encephalopathy, renal bone disease
Calcium, Magnesium	Hard water syndrome, hypertension, hypotension
Chloramine	Hemolysis, anemia, methemoglobinemia
Copper	Nausea, headache, liver damage, fatal hemolysis
Fluoride	Osteomalacia, osteoporosis
Sodium	Hypertension, pulmonary edema, confusion, headache, seizures, coma
Microbial	Pyrexia reactions, chills, fever, shock
Nitrate	Methemoglobinemia, hypotension, nausea
High iron	Hemosiderosis
Sulfate	Nausea, vomiting, metabolic acidosis
Zinc	Anemia, vomiting, fever
Aromatic hydrocarbons	Potential chemical carcinogens

Dialysis Rx:

Time: 2-5 hours

Blood flow rate: 400-450cc/min

Dialysate flow rate: 500-800cc/min

Anticoagulant

Additives:

- Anemia (EPO, blood)
- Bone metabolism (vit D, calcitriol, etc)
- Meds (antibiotics)

Dialysate Bath

Concentrations of dialysate components used in hemodialysis

Sodium (meq/L)	135 to 155
Potassium (meq/L)	0 to 4
Calcium (mmol/L)	1.25 to 1.75 (2.5 to 3.5 meq/L)
Magnesium (mmol/L)	0 to 0.75 (0 to 1.5 meq/L)
Chloride (meq/L)	87 to 120
Bicarbonate (meq/L)	25 to 40
Glucose (g/dL)	0 to 0.20

Data from Van Stone, JC. Hemodialysis: Hemodialysis apparatus. In: Handbook of Dialysis Daugirdas, JT, Ing, TS (Eds), Little, Brown, Boston, 1994. p. 53.

Dry-Weight



- **Achieving and maintaining dry-weight appears to be**
 - **An effective but forgotten strategy in**
 - **Controlling and maintaining normotension among hypertensive patients on hemodialysis**

Introduction



- The concept of dry-weight is as old as dialysis itself and
 - has been defined various ways and
 - evolved over time
- In 1967,
 - Dry-weight was initially defined by Thomson and colleagues as
 - Reduction of BP to hypotensive levels during ultrafiltration and unassociated with other obvious causes

Dry-weight: Definition



- Finally, in 2009, Sinha and Agarwal proposed a definition that
 - Combines subjective and objective measurements
- According to this recent definition,
 - Dry-weight is defined as the
 - lowest tolerated postdialysis weight achieved via gradual change in postdialysis weight at which there are minimal signs or symptoms of hypovolemia or hypervolemia

"Be Prepared!"



Acute complication HHCCBNF

Hypotension — 25 to 55 %

Cramps — 5 to 20 %

Nausea and vomiting — 5 to 15 %

Headache — 5%

Chest pain — 2 to 5 %

Back pain — 2 to 5 %

Itching — 5 %

Fever and chills — Less than 1 %

Hypotension

- Usual manifestation of hemodynamic instability during ultrafiltration dialysis (in which fluid removal is the primary goal)
- Why is it important?
- Whatever the underlying cause, patients with hemodialysis-associated hypotension appear to have **increased mortality**.

Chest pain

- Can be associated with hypotension and dialysis disequilibrium syndrome
- Always consider angina, hemolysis, and (rarely) air embolism
- Consider pulmonary embolism if recent manipulation of thrombus and/or occlusion of the dialysis access

Hemolysis

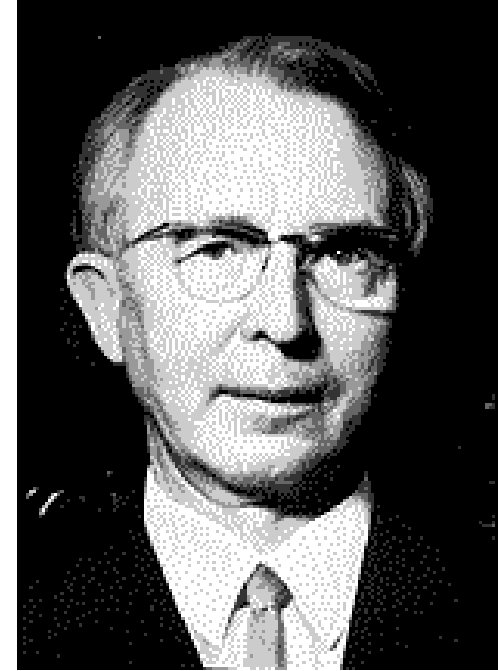
- Suggestive findings include port wine appearance of the blood in the venous line, a falling hematocrit, or complaints of chest pain, SOB, and/or back pain
- Usually due to dialysis solution problems, including overheating, hypotonicity, and contamination with formaldehyde, bleach, chloramine, or nitrates in the water, or copper in the dialysis tubing
- Treatment includes discontinuation of dialysis without blood return to the patient, and evaluation for hyperkalemia with medical treatment as necessary

Arrhythmias

- Common during, and between, dialysis treatments
- Controversial whether due to disturbances in plasma potassium
- Treatment is similar to the non-dialysis population, except for medication dosing adjustments



we should remember, also,
that Isaac Newton said, "If
I have seen farther, it is
because I've stood on the
shoulder of giants."



Thomas Graham
Graham's ability to
separate colloids
and crystalloids
using a so-called
"dialyzer"



Nils Alwall
the first
dialysis in
Sweden



OLDER STYLE OF MACHINE

Requires permanent plumbing connections



NEW MACHINE

No permanent plumbing connections required

New machine in portable setup



- Allows for travel
- Dialysate mixture can be pre-ordered to arrive into the next town in travel itinerary (no dependency on water supply)
- Increased quality of life for client

Photo Gallery



Photo Gallery



Kidney in Diabetes and Hypertension: the Deadly Alliance 3-6/2/2015

**Nephrology Day
Nephrology; Pros & Cons
September 2014**

قال صلى الله عليه وآله وسلم

(من لم يشكر الناس لم يشكر الله)



Thank you!

The image features the words "Thank you!" in a highly decorative, hand-drawn style. The letters are thick and outlined in black. The word "Thank" is rendered in orange, green, purple, and orange. The word "you!" is rendered in green, pink, and blue. The letters are adorned with various patterns, including wavy lines, zig-zags, and small dots. There are several colorful flowers (blue, pink, and blue) and a small blue oval shape with a green dot inside, all surrounding the text.